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Two new spider genera (Araneae: Amaurobiidae) from rainforests of Australia

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Manjala gen. n. and *Bakala* gen. n. are described and their relationship with *Ischalea*, a New Zealand spider is discussed. Four new species are described, *Manjala plana* sp. n., *M. pallida* sp. n., *M. spinosa* sp. n. and *Bakala episinoides* sp. n. The slit-like opening of an unusual sub-cutaneous area on the distal palpal tibia of males in *Manjala* spp. is shown.

Introduction

Most amaurobiids (*sensu* Lehtinen 1967) are cribellate, possess basic leg spination (Forster & Wilton 1973) and construct webs for the capture of prey. A few lose the cribellum and this is associated with reduced silk production and often with enlargement and increase in the number of spines on the fore-legs e.g. some *Dardurus* spp. (Davies 1976). *Manjala* and *Bakala* have been found only in the high altitude rainforest in Queensland and only one of the species *M. plana* is cribellate; all show reduced silk production and strong ventral spination of the fore-legs.

Ischalea spinipes Koch, 1872, from New Zealand was originally described with the tetragnathines. It had a chequered history of placement until Forster & Wilton (1973) put it in the Amaurobioidea in the Stiphidiidae. Its place in this family was challenged by Davies (1988) because of its habitus, well-developed median apophysis and reduced AME.

All measurements are in millimetres. In the notation of spines Platnick & Shadab (1975) have been followed and only those surfaces bearing spines are listed. The usual abbreviations for eyes AME, ALE, PME, PLE are used; other abbreviations follow Davies (1976) or are explained in the legend to figures.

New taxa

Manjala gen. n.

Diagnosis: Pale, 3-clawed spiders with long spinose legs. Carapace flat, narrower in the eye region (Figs. 1, 2). Eyes in almost straight rows; AME smallest. Abdomen long. Chelicera with long proximal bristle on front crossing that on

other chelicera at tip (Fig. 18). Egg-sac placed in suspended leaf in 'nursery' web: ♀ rests on or in leaf in tetragnathid-like position with fore-legs stretched forwards and hind-legs backwards.

Description: Straw-coloured cribellate or ecribellate spiders with two dark marks on the abdomen near the posterior dorsal sigilla, otherwise showing little pattern. Anterior row of eyes straight, ALE overhanging clypeus, posterior row recurved; eyes circled with black pigment. Clypeus narrow about equal to diameter of AME. Sternum slightly longer than wide, broadly truncate anteriorly, pointed posteriorly. Serrula on maxilla. Labium about as wide as long. Chelicera vertical with 2 retromarginal and 3–4 promarginal teeth; a long thick filamentous seta on either side of base of fang (Fig. 21), similar to but longer than the thick outer promarginal setae of the scopula. Legs long (1243) with numerous strong paired ventral spines on tibiae and metatarsi I (Fig. 7) and II; metatarsi long, tarsi short; light scopula on tarsi and distal metatarsi. Trochanters shallowly notched or un-notched. Trichobothria in double row on tibiae, single row on metatarsi and tarsi. Bothria finely grooved, collariform; tarsal organ with pear-shaped opening. Calamistrum, if present proximal. Superior claws pectinate, inferior claw with single tooth; ♀ palpal claw pectinate. Abdomen long, slightly flattened dorso-ventrally. Divided cribellum or small flat colulus. Posterior spinnerets about same length as and more slender than anterior spinnerets. Relatively large anal tubercle (0.8 × basal segment of posterior spinneret) triangular with broad base and pointed apex (Fig. 4). Small epigynum with anterior gonopores; lateral teeth present or reduced. Cymbium of male palp more than twice length of bulb, without retrobasal excavation. Long spiniform embolus arising basally, lying in groove along lightly sclerotized conductor for most of its length; spoon-shaped median apophysis (Fig. 25); a small pointed prolateral tegular apophysis (Fig. 22) present near the origin of and hidden by the conductor. Tibia of male palp long with retrolateral and retrodorsal apophyses; tiny circular area just posterior to retrolateral process (Fig. 8). Tracheal system with 4 simple branches in abdomen.

The generic name *Manjala* is derived from an Aboriginal word meaning 'mountain'. The type species is *M. plana*.

***Manjala plana* sp. n.**
(Figs. 1–8, 18–20, 22–24, Table 1)

Holotype: from outside sealed leaf in nursery web in rainforest, Binna Burra, Lamington National Park, southeast Queensland, B. J. Marples, M. J. Marples, V. E. Davies, 7.I.1977, 1 ♀, QM S11342. — Paratypes: Same locality, sweeping, Y. Lubin, R. J. Raven, V. E. Davies, 12.II.1981, 1 ♂, QM S11340, 5 ♀, 1 ♂ QM S11337; B. J. Marples, M. J. Marples, V. E. Davies, 7.I.1977, 3 ♀, QM S11341; D. J. Court, J. Gallon, V. E. Davies, 18.V.1983, 2 ♀, QM S11336; R. J. Raven, V. E. Davies, 29.III.1976, 13 ♀, QM S11335; Nagarigoon, Lamington National Park, V. E. Davies, N. Hall, 8.IV.1976, 5 ♀, QM S11339; Lamington National Park, R. J. Raven, 10.VIII.1977, 1 ♂, QM S11338.

Female: CL 2.7, CW 2.1, AL 4.6, AW 1.6. Eye region of carapace 0.7 × width of thorax. Ratio of AME:ALE:PME:PLE is 4:6:5:6; posterior row slightly recurved. Clypeus slightly less than diameter of AME. Sternum (Fig. 3) longer than wide, 1:0.8; maxilla longer than wide, 1:0.6. Labium about as long as wide, 0.5 × length of maxilla. Frontal cheliceral bristles stout; 2 retromarginal and 4 promarginal cheliceral teeth (third proximal smaller than others). Leg measurements are given in Table 1. Notation of spines. Femora: I, D1-1-1, P0-2-1, R0-1-1; II, D1-1-1, P0-1-1, R0-1-1; III, D1-1-1, P0-1-1, R0-0-1; IV, D1-1-1, P0-0-1, R0-0-1. Patellae: I, II, III, IV, D1-0-0. Tibiae: I, D1-0-1, P0-1-0, V6-6-4 (8 pairs), R0-1-0; II, D1-1-0, P1-0-0, V6-4-4 (7 pairs), R0-1-0; III, D1-1-0, P1-0-1, V1-2-0, R0-1-1; IV, D1-1-0, P1-1-1, V0-1-0, R1-0-1. Metatarsi: I, P1-1-1, V4-4-4, R1-1-1; II, D0-1-0, P1-1-1, V4-4-4, R1-1-1; III, D0-1-0, P1-1-2, V-2-2-1, R-1-1-2; IV, D0-0-1, P1-1-2, V2-2-1, R1-1-1. Superior claws with 14 teeth, inferior claw with one tooth. Palpal claw with 10 teeth. Calamistrum a single row of 10 curved setae. Abdomen clothed with hairs becoming longer on the sides of the posterior third of abdomen. A patch of sparse, thick setae on venter in area of ventral sigilla. Epigynum with small lateral teeth; insemination duct with vase-shaped entry visible through integument.

Other females varied in size: CL 2.4–2.8, CW 1.8–2.0, AL 3.3–4.4, AW 1.6–2.3.

Male: CL 2.4, CW 2.1, AL 4.0, AW 1.8. Eye region of carapace 0.5 × width of thorax. Legs longer than those of ♀ (Table 1). Spination of legs similar to ♀ but with fewer tibial spines: I, V6-4-4; II, V4-4-4. Without cribellum and without patch of setae on venter. ♂ palp (Figs. 8, 19, 20): small triangular retrodorsal tibial process, blunt retrolateral process and tiny circular area.

Variation in size: CL 2.3–2.6, CW 1.7–2.2, AL 3.4–4.0, AW 1.4–1.8.

Biology: Juvenile spiders were found in litter collections. ♂♂ were collected in sweep nets or hand collected at night. ♀♀ were found in the understorey lying along the outside of or inside sealed leaves each of which contained an egg-sac. The leaves were suspended by the petiole and the edges 'grafted' together with silk almost down to the tip leaving an opening where the spider's fore-legs are seen when it is in the retreat. Cribellate threads were found among the threads of silk forming the nurseries in which the leaves are suspended. It is not known whether these threads entrap prey.

Table 1. Leg measurements (mm) of *Manjala* and *Bakala* species.

Leg	Fem	Pat	Tib	Met	Tar	Total
M. plana						
I	3.6	0.9	4.2	3.8	0.9	13.4
II	2.9	0.9	3.3	3.2	0.9	11.2
III	2.4	0.8	2.2	2.3	0.8	8.5
IV	2.9	0.8	2.6	3.3	1.0	10.6
♂ I	4.4	1.0	5.0	5.3	1.4	17.1
II	3.8	0.9	4.1	4.1	1.1	14.0
III	2.8	0.8	2.8	2.9	0.9	10.2
IV	3.4	0.8	3.1	3.9	1.1	12.3
M. pallida						
♀ I	4.4	1.0	5.0	4.8	1.6	16.8
II	3.9	0.9	4.2	4.0	1.4	14.4
III	2.8	0.8	2.7	2.9	1.0	10.2
IV	3.4	0.8	3.0	4.0	1.3	12.5
♂ I	6.3	1.0	7.1	7.5	2.3	24.2
II	5.0	1.0	5.5	5.6	1.6	18.7
III	3.4	0.8	3.7	3.8	1.2	12.9
IV	4.3	0.9	3.8	5.3	1.5	15.8
M. montana						
♀ I	2.4	0.8	2.9	2.5	0.7	9.3
II	2.2	0.7	2.4	2.3	0.6	8.2
III	1.8	0.6	1.6	1.8	0.6	6.4
IV	2.1	0.6	1.9	2.4	0.8	7.8
B. episinoides						
♀ I	2.6	0.6	3.1	3.0	0.8	10.1
II	2.5	0.6	3.0	2.9	0.8	9.8
III	1.7	0.4	1.8	2.0	0.6	6.5
IV	2.0	0.5	2.0	2.8	0.9	8.2

***Manjala pallida* sp. n.**
(Figs. 9–11, 21, 25–29, Table 1)

Holotype: Bellenden Ker Range, 1560 m, Earthwatch/Queensland Museum Expedition, 25–31.X.1981, 1 ♀, QM S11344. — Paratypes: Same locality, collectors and dates, sweeping, hand collecting, 1 ♂ (palp SEM), QM S11343; 2 ♀, 8 ♂, QM S11346; 1–7.XI.1981, 2 ♂, QM S11348, gutter traps, 17.X–7.XI.1981, 2 ♂, QM S11350; same locality, G.B. Monteith, D. K. Yeates, 29.IV–2.V.1983, 1 ♀, QM S11349; pyrethrum knockdown, G. B. Monteith, D. K. Yeates, G. Thompson, 28.X.1983, 2 ♀, 1 ♂, QM S11347.

Female: CL 2.4, CW 1.9, AL 4.7, AW 2.0. Ecribellate spider, larger and with longer legs than *M. plana*. Ratio of AME:ALE:PME:PLE is 3:6:5:6; posterior row slightly recurved. Sternum longer than wide 1:0.8; maxilla longer than wide, 1:0.6. Labium about as long as wide, 0.5 × length of maxilla. Frontal cheliceral bristles long and slender; 2 retromarginal and 4 promarginal cheliceral teeth. Leg measurements are given in Table 1. Spination of legs similar to that of *M. plana* with the following differences on tibiae and metatarsi. Tibiae: I, D1-0-1, P0-1-0, V4-6-4 (7 pairs), R0-1-0; II D1-0-1, P1-0-0, V4-4-4 (6 pairs), R0-1-1; III D1-0-1, P1-0-1, V0-2-0, R0-0-1; IV D1-0-1, P0-1-1, R0-1-1. Metatarsi: I P1-1-0, V4-4-4, R1-1-0; II, P2-1-1, V2-2-2, R2-0-1; III P1-1-1, V2-2-3, R1-1-1; IV D1-0-0, P1-1-1, V2-2-3, R1-1-1. Colulus small. Abdomen without patch of thick setae on venter. Epigynum with lateral teeth (Figs. 9, 10).

Other females varied in size: CL 2.2–2.5, CW 1.9–2.0, AL 3.8–5.0, AW 1.5–2.3.

Male: CL 2.6, CW 2.0, AL 4.7, AW 1.4. Eye region of carapace 0.5 × width of thorax. Ratio of AME:ALE:PME:PLE is 4:7:6:7. Legs longer than those of ♀. Spination of legs similar to ♀ but with less tibial spines: I, V4-4-4; II, V4-2-4. ♂ palp (Figs. 25, 26) with spur-like retrodorsal tibial apophysis. The small circular area seen below the retrolateral apophysis appears to be mostly subcutaneous, the electron micrograph revealing only

a slit-like transverse opening (Fig. 28). A slit sensilla (Fig. 29) is located below this area.

Variation in size: CL 2.4–2.8, CW 1.8–2.3, AL 4.1–5.5, AW 1.3–1.8.

Biology: Females were found in leaves sealed along edges and suspended in a tangle of threads. Each leaf contained an egg-sac. Other ♀♀ and ♂♂ were captured by hand, by sweeping or in ground traps.

Manjala spinosa sp. n.

(Figs. 12, 13, Table 1)

Holotype: Rainforest, Windsor Tableland, northeast Queensland, Australia New Zealand Scientific Exploration Society, 29.XII.1980, 1 ♀, QM S11353.

Female: CL 2.0, CW 1.7, AL 3.1, AW 1.9. Ecribellate spider, smaller than the other species. Cephalon flat, carapace slightly humped behind fovea. The ratio of AME:ALE:PME:PLE is 3:6:5:6; posterior row recurved. Clypeus is equal to diameter of AME. Sternum slightly longer than wide 1:0.9, bluntly pointed posteriorly; maxilla is longer than wide 1:0.7. Labium slightly wider than long, 0.5×maxilla. Frontal cheliceral bristles missing but scars suggest they were present; retromargin of chelicera with 2 teeth, promargin with 3. Leg measurements are given in Table 1. Spination of legs similar to *M. plana* with minor differences in tibiae and metatarsi. Tibiae: I, D0-0-1, P0-1-0, V6-6-4, R0-1-0; II, D0-0-1, P1-0-1, V6-4-4, R0-1-0; III, D1-0-1, P1-0-1, V1-2-0, R0-1-1; IV D1-0-0, P1-0-1, V1-1-0, R1-0-1. Metatarsi: I, D0-1-0, P2-0-0, V4-4-4, R1-1-0; II, D1-1-0, V2-4-2, R0-1-0. Colulus small. Abdomen relatively shorter than other species with patch of sparse thick setae on venter. Epigynum very small (Figs. 12, 13), lateral teeth not seen.

Male: Unknown.

Bakala gen. n.

Diagnosis: Pale ecribellate spiders with long spinose legs. Carapace flat, narrower in eye region. Anterior row of eyes slightly procurved, AME much smaller than rest; posterior row recurved. Abdomen broadest in middle-region tapering behind (Fig. 14). Chelicera with long proximal bristle in front crossing that on other chelicera at tip.

Description: Small spider with dark markings on edge of carapace opposite leg I and between II and III and between III and IV. Shallow fovea marked by pigmented area. Dark pigmented band on distal femora and tibiae I, II and IV. Eyes circled in black pigment; ALE overhanging clypeus. Sternum truncate anteriorly, blunt posteriorly. Serrula on maxilla. Retromargin of chelicera with 2 teeth; a long seta on either side of base of fang. Legs (1243) with numerous long paired ventral spines on tibiae and metatarsi. Trochanterae un-notched. Trichobothria in double row on tibiae and single row on metatarsi and tarsi. Bothria collariform; tarsal organ with pear-shaped opening. Superior and inferior tarsal claws toothed ♀ palpal claw toothed. Abdomen flattened dorsoventrally. Flat colulus. Posterior spinnerets about same length as and more slender than anterior spinnerets. Anal tubercle relatively large (0.8 × basal segment of posterior spinnerets). Small epigynum with anterior gonopores and thin insemination ducts.

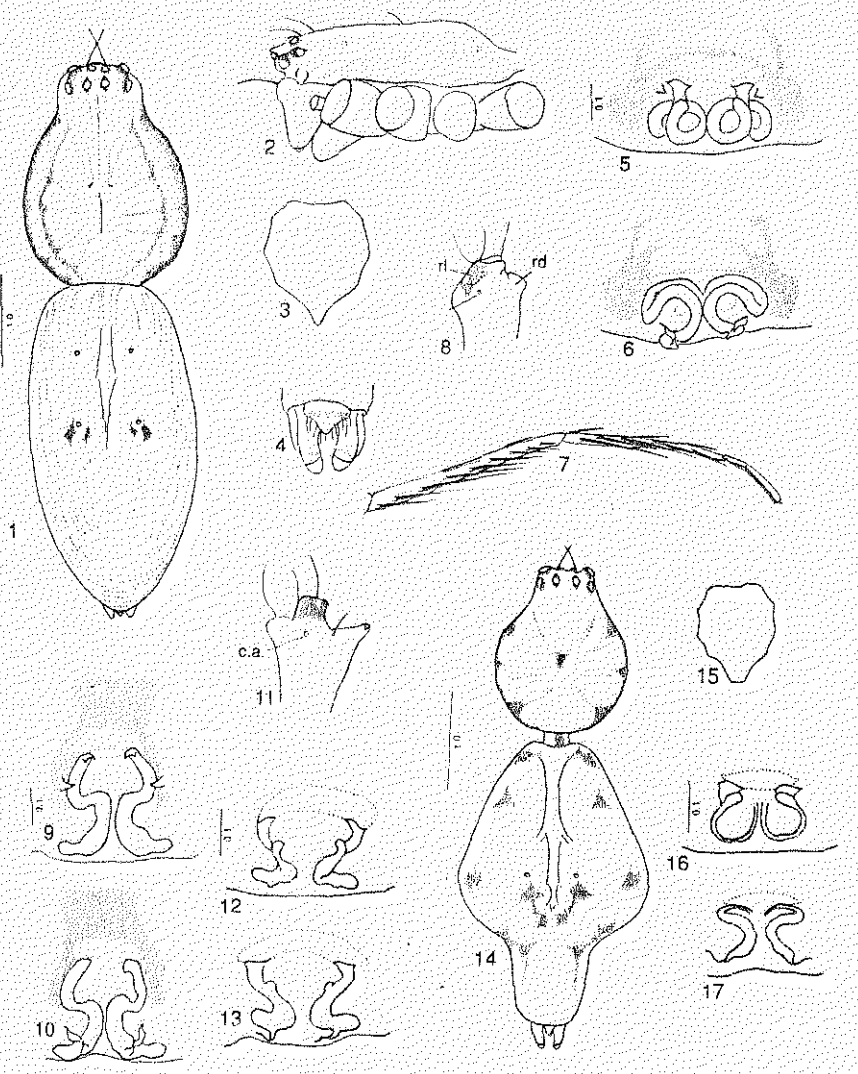
The generic name *Bakala* is derived from the Aboriginal word meaning 'prickle'. The type species is *B. episinoides*, named after *Episinus* which has a similarly shaped abdomen.

Bakala episinoides sp. n.

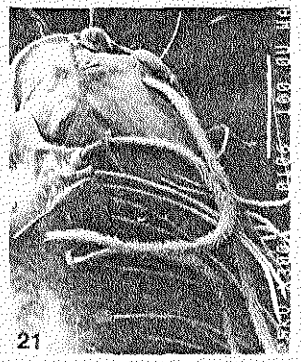
(Figs. 14–17, 30, Table 1)

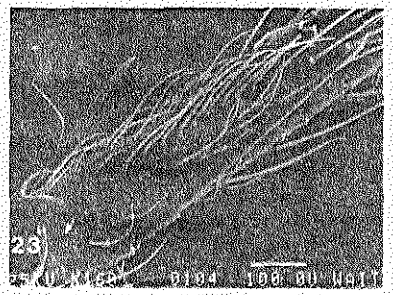
Holotype: Beating, rainforest, Major's Mountain, northeast Queensland, V. E. Davies, R. Raven, 14–20.IV.1978, 1 ♀, QM S11352. — Paratype: Beating, rainforest, Bellenden Ker Range, northeast Queensland, 1054 m, Earthwatch/Queensland Museum Expedition, 25–31.X.1981, 1 ♀, QMS11351.

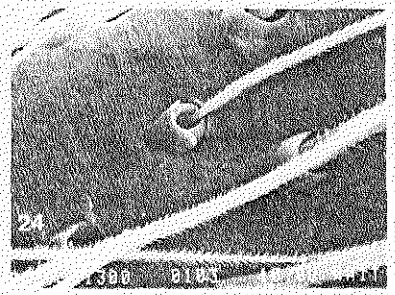
Female: CL 1.6, CW 1.3, AL 2.5, AW 1.6. The ratio of AME:ALE:PME:PLE is 2:6:5:6. Clypeus is slightly wider than AME. Sternum (Fig. 15) is longer than wide 1:0.8. Maxilla is longer than wide 1:0.8. Labium is slightly wider than long, 0.5 ×maxilla. Leg measurements are given in Table 1. Notation of spines. Femora: I, D1-1-1, P0-1-1, R0-1-1; II, D1-1-1, P0-0-1, R0-1-1; III, D1-1-1, P0-1-1; IV, D1-1-1, P0-0-1. Patellae: I-IV, D1-0-1. Tibiae: I, D0-1-1, V4-4-4; II, D0-1-1, V4-4-2



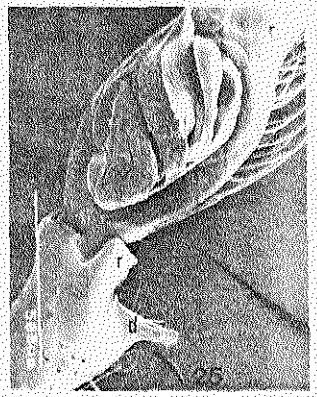
Figs. 1–17.
1–7. *Manjala plana* sp. n. — 1, dorsal view. — 2, cephalothorax lateral. — 3, sternum. — 4, anal tubercle, spinnerets. — 5, 6, epigynum, ventral, dorsal. — 7, tibia, metatarsus, tarsus leg 1.
8. *M. plana*, left palpal tibia, retrolateral apophysis (*rl*), retrodorsal apophysis (*rd*), circular area (*c.a.*).
9–11. *Manjala pallida* sp. n. — 9, 10, epigynum, ventral, dorsal. — 11, left ♂ palpal tibia, circular area (*c.a.*).
12–13. *Manjala spinosa* sp. n., epigynum, ventral, dorsal.
14–17. *Bakala episinoides*. — 14, dorsal view. — 15, sternum. — 16, 17, epigynum, ventral, dorsal.

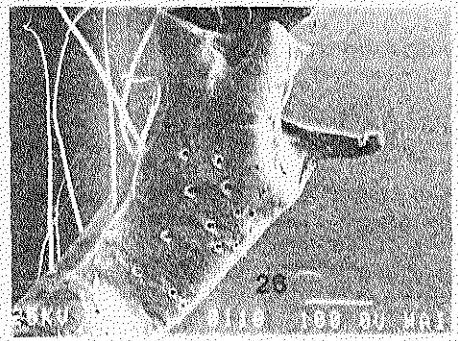


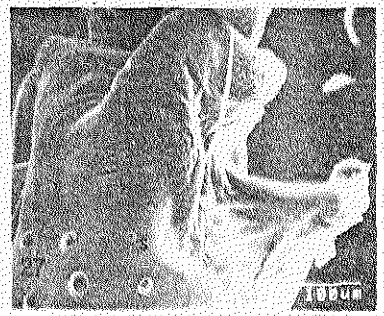


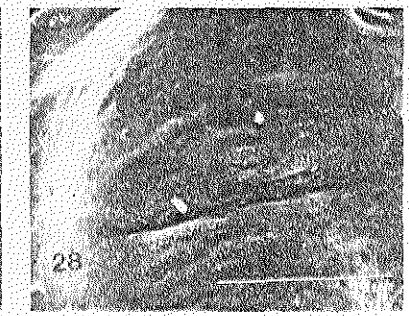


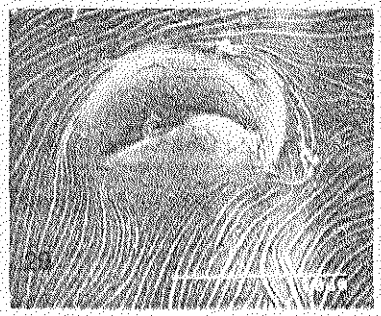
Figs. 18–24.
18–20. *M. plana*. — 18, ♀ eyes, chelicerae, cheliceral bristles (*sp*). — 19, ♂ right palp, conductor (*c*), embolus (*e*), median apophysis (*m*). — 20, ♂ tibial apophyses.
21, ♀ *M. pallida*, base of fang, prolateral.
22–24. *M. plana*. — 22, ♂ palp, prolateral, tegular process (*p*). — 23, ♀ calamistrum. — 24, trichobothrium leg 1.

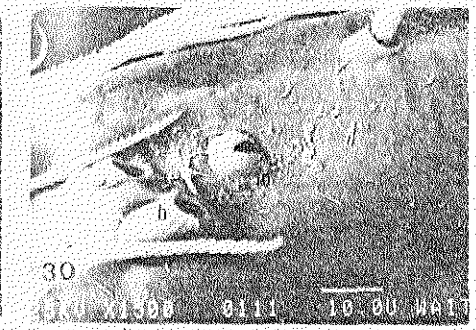












Figs. 25–30.
25–29. *M. pallida*. — 25, left palp, retrolateral apophysis (*r*), retrodorsal apophysis (*d*). — 26–27, tibial apophyses, transverse opening (*t*), slit sensilla (*s*). — 28, transverse opening in circular area. — 29, slit sensilla.
30. *Rakala episinoides* sp. n., leg 1, bothrium (*b*), tarsal organ (*to*).

III, D1-1-0, P0-0-1, V0-2-0, R0-0-1; IV, D1-0-1, P0-1-1, R0-1-1. Metatarsi: I, D0-1-0, P2-0-0, V4-2-2, R2-0-0; II, P1-0-0, V4-2-2, R2-0-0; III, V2-2-2; IV, D1-1-0, P1-0-1, V0-2-0, R0-0-1. Colulus small. Epigynum very small (Figs. 16, 17), lateral teeth not seen.

Measurements of other females: CL 1.8, CW 1.4, AL 3.1, AW 2.1.

Male: Unknown.

3. Relationship of *Manjala* and *Bakala* to each other and to *Ischalea*

Manjala and *Bakala* both possess an enlarged seta on front of chelicera which is considered a synapomorphy for these genera. A better character may emerge when male *Bakala* are described. The long thick filamentous setae at the base of the fang have been observed in other amaurobioids; it is not known how widespread the character is.

Ischalea spinipes was re-described by Forster & Wilton (1973). It is a pale spider with long spiny legs, particularly I and II. It is found on foliage or under logs in forest. At rest it presents a tetragnathid-like stance. It is ecribellate and does not appear to build a snare; there are no records of egg-laying. The eyes are in almost straight rows; AME smallest. The setae on the front of the chelicerae are slightly elongated but not enlarged; a long thick filamentous seta is present at either side of the fang. The abdomen is long. There is a single row of trichobothria on the tarsus and metatarsus. The epigynum has lateral teeth; insemination ducts are simple with anterior gonopores. The ♂ palp has a long cymbium, a well developed median apophysis, retrolateral and retrodorsal apophyses on the long tibia. Besides *Manjala*, *Bakala* and *Ischalea*, a few other amaurobiids, some undescribed, possess these characters. It is not known how widespread the large anal tubercle is. The unusual subcutaneous area on the palpal tibia of the ♂ *Manjala* was not seen in *Ischalea*. A possible apomorphy for these three genera is the flat cephalon which is unusual and perhaps unique among Australasian amaurobiids. *Hauroko*, a New Zealand genus with a flat carapace is placed in the Psechridae by Forster & Wilton (1973).

As the Amaurobiidae are still to be clearly diagnosed it is difficult to make reasonable subdivisions; it is suggested that these three genera form a natural group, the ischaleines.

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Changes in the spider fauna over 14 years in an industrially polluted area in Holland

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A small peat-bog on Dutch territory on the periphery of the Kalmthoutse Heide National Park (Belgium) was monitored in 1974–1979 and 1986–1989 by means of pitfall traps. Five traps were used on points that remained identical throughout the experiment. The area is situated about 6 kilometers from a 16 km long area of production plants of the chemical and petrochemical industry and a nuclear power station in the Antwerp area, to the NE and in the dominant wind direction from that area.

In the second period a dramatic drop in the numbers of wolfspiders and other larger wandering spiders was found; among the 6 most frequent species 4 showed a conspicuous decrease, whereas only one (*Pirata uliginosus*) increased in number. These results, though obtained with a limited number of traps, were very consistent. The web-building spiders, mainly Linyphiidae, were found much less frequently in the traps. *Centromerus sylvaticus* showed a sharp rise in numbers; most other species increased slightly. *Pholcomma gibbum* had altogether disappeared in the second period.

The advance of grass (*Molinia*) over *Erica* resulting from SO_x and NO_x deposition was slight over the period of study as testified by photographs taken at a 10 years' interval. Possible influences of air pollution, climate (lowering of the groundwater table) and vegetation are discussed.

1. Introduction

One of the largest agglomerates of the chemical and petrochemical industry in the Benelux (among which Bayer, BASF, Degussa, Union Carbide, Esso, B.P. Belgium, Petrochim) is situated in West Flanders on the Scheldt river. It is 16 km long and is situated at about 8 km distance in the SW (the dominating) wind direction from the large Belgian-Dutch Nature Reserve "Kalmthoutse Heide". Most of the production plants were started in the early seventies, but construction and projection of new units continues till the present day. The complex is known to be an important source of air pollution, emitting SO_x, toxic chlorated and polycyclic aromatic hydrocarbons, metals and innumerable other compounds. Ozone levels are high. Particularly notorious compounds such as benzene, chlorine, benzenevinylchoride, acrylonitrile, methylisocyanate and trichloroethane are